

WHAT IS CLAIMED IS:

1. A bicycle rim comprising:
an annular tire attachment portion adapted to have a tire mounted thereon;
an annular spoke attachment portion fixedly coupled with said tire attachment portion to form an annular hollow area, said spoke attachment portion including a plurality of circumferentially spaced attachment openings with each attachment opening having a central axis; and
a plurality of separate reinforcement members fixedly coupled to an exterior surface of said spoke attachment portion at said attachment openings to effectively increase the thickness of said spoke attachment portion of said rim at said attachment openings, each of said reinforcement members being located exteriorly of said hollow area and having a through opening that is aligned with one of said attachment openings.
2. The bicycle rim according to claim 1, wherein
each of said through openings is substantially coincident with a respective one of said attachment openings as viewed along said central axis of said respective one of said attachment openings.
3. The bicycle rim according to claim 1, wherein
each of said reinforcement members has a maximum overlapping dimension that overlaps said annular spoke attachment portion that is at least as large as a maximum transverse dimension of a respective one of said attachment openings as measured from an outer peripheral edge of said reinforcement member to said respective one of said attachment openings.
4. The bicycle rim according to claim 1, wherein
each of said reinforcement members has a rim facing surface that corresponds to a contour of said exterior surface of said spoke attachment portion.
5. The bicycle rim according to claim 1, wherein
each of said reinforcement members is welded to said spoke attachment portion.

6. The bicycle rim according to claim 5, wherein each of said reinforcement members is welded around an outer periphery thereof that is spaced from a respective one of said attachment openings.

7. The bicycle rim according to claim 1, wherein each of said reinforcement members is brazed onto said spoke attachment portion.

8. The bicycle rim according to claim 7, wherein each of said reinforcement members is brazed around an outer periphery thereof that is spaced from a said respective one of said attachment openings.

9. The bicycle rim according to claim 1, wherein each of said attachment openings of said spoke attachment portion is threaded, and said through opening of each of said reinforcement members is threaded.

10. The bicycle rim according to claim 1, wherein each of said attachment openings of said spoke attachment portion is unthreaded, and said through opening of each of said reinforcement members is unthreaded.

11. The bicycle rim according to claim 1, wherein the spoke attachment portion includes a pair of annular side sections extending radially outwardly from an inner annular section to form a first substantially U-shaped cross-sectional shape as viewed in a transverse cross-sectional direction; and said tire attachment portion includes a pair of annular tire support sections and an annular bridge section that extends between said tire support sections to form a second substantially U-shaped cross-sectional shape as viewed in said transverse cross-sectional direction in order to form said annular hollow area together with said spoke attachment portion.

12. The bicycle rim according to claim 11, wherein said annular bridge section is free of openings except for a single valve aperture formed therein; and

said spoke attachment portion includes a valve opening aligned with said single valve aperture of said annular bridge section.

13. The bicycle rim according to claim 11, wherein
said annular side sections and said inner annular section of said spoke attachment portion, and said annular tire support sections and said annular bridge section of said tire attachment portion are integrally formed together as a one-piece, unitary member that is separate from said reinforcement members.

14. The bicycle rim according to claim 1, wherein
said attachment openings are formed in an inner annular section of said spoke attachment portion that forms an inner radial periphery of said rim such that said central axes of said attachment openings extend in a substantially radial direction of said rim.

15. The bicycle rim according to claim 14, wherein
each of said reinforcement members has a symmetrical shape relative to a center plane of said rim, and
each of said reinforcement members has a symmetrical shape relative to a center radial plane thereof that is perpendicular to said center plane.

16. The bicycle rim according to claim 14, wherein
each of the reinforcement members has a maximum overall circumferential dimension at least as large as a maximum overall axial dimension thereof.

17. The bicycle rim according to claim 14, wherein
each of said reinforcement members has a base portion with a first thickness and a central projecting portion extending radially inwardly from said base portion, said projecting portion having a second thickness that is at least twice said first thickness, and
said through opening of each reinforcement member is formed in said projecting portion.

18. The bicycle rim according to claim 17, wherein

said base portion of each of said reinforcement members includes a tapered section extending around an outer periphery thereof.

19. The bicycle rim according to claim 14, wherein each of said through openings is substantially coincident with a respective one of said attachment openings as viewed along said central axis of said respective one of said attachment openings.

20. The bicycle rim according to claim 14, wherein each of said reinforcement members has a maximum overlapping dimension that overlaps said annular spoke attachment portion that is at least as large as a maximum transverse dimension of a respective one of said attachment openings as measured from an outer peripheral edge of said reinforcement member to said respective one of said attachment openings.

21. The bicycle rim according to claim 1, wherein said spoke attachment portion of said rim has a substantially uniform radial thickness in an annular area where said reinforcement members are fixed.

22. The bicycle rim according to claim 1, wherein said spoke attachment portion and said tire attachment portion are integrally formed together as a one-piece, unitary member that is separate from said reinforcement members.

23. A method of making a bicycle rim, comprising:
forming an annular rim that includes an annular tire attachment portion and an annular spoke attachment portion fixedly coupled with the annular tire attachment portion to form an annular hollow area;
fixedly coupling a plurality of reinforcement members to an exterior surface of the spoke attachment portion such that the reinforcement members are located exteriorly of the annular hollow area in a circumferentially spaced arrangement to effectively increase the thickness of the spoke attachment portion; and

forming a plurality of attachment openings with one of the attachment openings extending through one of the reinforcement members and through the spoke attachment portion of the rim.

24. The method according to claim 23, wherein the forming the attachment openings occurs after the fixedly coupling the reinforcement members to the spoke attachment portion.

25. The method according to claim 23, further comprising forming internal threads in the attachment openings.

26. The method according to claim 23, wherein the fixedly coupling of the reinforcement members to the annular spoke attachment portion is achieved by welding.

27. The method according to claim 23, wherein the fixedly coupling of the reinforcement members to the annular spoke attachment portion is achieved by brazing.

28. The method according to claim 23, wherein the forming of the annular rim includes forming the spoke attachment portion with a pair of annular side sections extending radially outward from an inner annular section to form a first substantially U-shaped cross-sectional shape as viewed in a transverse cross-sectional direction, and

the forming of the annular rim includes forming the tire attachment portion with a pair of annular tire support sections and an annular bridge section that extends between the tire support sections to form a second substantially U-shaped cross-sectional shape as viewed in the transverse cross-sectional direction.

29. The method according to claim 28, wherein the annular side sections and the inner annular section of the spoke attachment portion, and the annular tire support sections and the annular bridge section of the tire attachment portion are integrally formed together as a one-piece, unitary member during the forming of the annular rim.

30. The method according to claim 28, wherein the plurality of attachment openings are formed in the inner annular section of the spoke attachment portion.

31. The method according to claim 30, further comprising forming internal threads in the attachment openings.

32. The method according to claim 31, further comprising forming a single valve aperture in the annular bridge section without forming any other openings in the annular bridge section; and forming a single valve opening in the spoke attachment portion that is aligned with the single valve aperture of the annular bridge section.

33. The method according to claim 30, further comprising forming a plurality of circumferentially spaced access openings in the annular bridge section that are configured to be substantially aligned in a radial direction with the plurality of attachment openings.